

detail, so that the student can make them in the laboratory and gain an idea of their individual properties.

There will be no difference of opinion amongst teachers as to the futility of such a plan. The student can get no proper idea of chemistry as a subject, or of its theories and application. He will regard it merely as a series of manipulations, and his text-books as akin to cookery books.

At a time when the teaching of chemistry to medical students is steadily improving it is disconcerting to notice a tendency in the reverse direction in the case of biological students, which unhappily is not confined to the Continent.

MATHEMATICAL BOOKS: ELEMENTARY AND ADVANCED.

- (1) *Arithmetic*. By H. Freeman. Pp. viii+231+xxxi. (London: G. Bell and Sons, Ltd., 1914.) Price 2s. 6d.
- (2) *The School Algebra*. By A. G. Cracknell. Pp. viii+568+lxxvii. (London: University Tutorial Press, Ltd., 1914.) Price 5s.
- (3) *Statics*. By R. C. Fawdry. Part i. Pp. vii+165. (London: G. Bell and Sons, Ltd., 1914.) Price 2s. 6d.
- (4) *A First School Calculus*. By R. Wyke Bayliss. Pp. xii+288. (London: E. Arnold, n.d.) Price 4s. 6d.
- (5) *A Treatise on Differential Equations*. By Prof. A. R. Forsyth. Fourth edition. Pp. xviii+584. (London: Macmillan and Co., Ltd., 1914.) Price 14s. net.
- (6) *Linear Algebras*. By Prof. L. E. Dickson. Pp. viii+73. (Cambridge University Press, 1914.) Price 3s. net. Cambridge Tracts in Mathematics and Mathematical Physics, No. 16.
- (7) *The Elements of Non-Euclidean Geometry*. By Dr. D. M. Y. Sommerville. Pp. xvi+274. (London: G. Bell and Sons, Ltd., 1914.) Price 5s.
- (8) *A New Analysis of Plane Geometry, Finite and Differential, with numerous examples*. By A. W. H. Thompson. Pp. xvi+120. (Cambridge University Press, 1914.) Price 7s. net.

(1) **T**HIS book consists mainly of examples, and there is said to be "just sufficient bookwork to be of use to a pupil when in difficulty." We do not think that, for example, any difficulty a pupil may feel about negative numbers can be dispelled by a complete absence of "bookwork" about them (p. 7).

(2) The aim of this book is to bring the teaching of elementary algebra into closer touch with "intelligible" calculations, and also to give a clear account of the elements of algebraic theory. The author warns us that "a rigorous logical

account of the fundamental laws of algebra is very difficult, and would be quite out of place in a book of this description." Accordingly, we find, on p. 172, that "*the* negative unit" is defined as "*a* unit which cancels a positive unit" (the italics are ours). In this confusion between definite and indefinite articles, there seems to be some departure from the author's intention to give a clear account of things. The author seems to recognise that such things as the law of signs does present difficulties, but his treatment is not satisfactory. The book is not without merits.

(3) This pleasant little book shows the very healthy influence that the work of Mach has exerted on the teaching of mechanics. It deals with the subject on an experimental basis, and contains many examples, mostly numerical.

(4) This is an attempt to introduce the calculus by means of simple questions based upon matters familiar to the student either from his every-day experience or from his work in the laboratory. It is said to be "planned upon the latest educational theories," but this ought not to prejudice us against a very sound book which contains none of the subtlety that is required in higher walks of mathematics. For example, on p. 153, under the stimulating heading of "The Borderland of Discovery," the introduction of new functions by integration is treated apparently on the principle that any combination of symbols whatever must mean something. This is rather a natural supposition for most budding mathematicians to make, but it would be as well to warn them of possible dangers.

(5) The third edition of this well-known and solid work was published in 1903. This fourth edition is larger, but the general scope of the book is unaltered. Prof. Forsyth's object is to produce a working text-book, and the general theory is scarcely touched upon. Thus, such subjects as theorems of existence are noticed only by a reference to the author's "Theory of Differential Equations." There is an advantage, says the author, "even if only of conciseness," in assuming some results of the theory. Some parts of the book have been re-written, particularly the early part of the chapter on the hypergeometric series, and parts of the chapters on partial differential equations. A number of short additions has been made: on ordinary linear equations with some of their integrals of the type called "regular"; on total differential equations; and on partial equations. The only misprint—if, indeed, it is a misprint—that we have been able to find is a reference in the index to Abel on a page where algebraic functions are spoken of, and not Abel. It is perhaps almost inevitable that a text-book on

differential equations should not excite a learner's vivid interest unless it so departs from the logical order as to be historical. Often a modified logical order seems the easiest and most natural order. But the problem of education seems to be rather a problem of awakening interest, and not of choosing "natural" paths. Difficulties cease to matter if one's interest is aroused.

(6) Prof. Dickson's introduction to the general theory of linear algebras, including also non-associative algebras, shows in many places the influence of the German "Encyklopädie." The exposition of the main theorems of the general theory follows Cartan and, to some extent, Wedderburn, and is a most useful introduction to the subject.

(7) Here is an excellent text-book for all students of geometry. As seems to be always the case with this subject, the treatment is, to a great extent, historical, but the analytical treatment begun by Riemann occupies a rather minor position. A very welcome feature is that, throughout this book, Euclidean geometry is exhibited as a particular case of non-Euclidean geometry, and the apparent want of symmetry and the occasional failure of the principle of duality are explained. It seems rather confusing to assume tacitly, as the author does on p. 30, that through any point there are in hyperbolic geometry two, and only two, parallels to a given straight line.

(8) This book claims, rather magisterially, to be original. It seems to us more interesting than strikingly original. The equation of a line, $y = mx + c$, may be regarded as having the co-ordinates m and c . By using the word "measure" to denote a concept including both the distance of two points from one another, the perpendicular distance from a point to a line, and the angle between two lines, it is possible to state shortly what co-ordinate geometry does. This is the reduction of a set of joins and intersections of points and lines to functions of the measures of the elements. This idea is developed by the author and applied also in differential geometry.

φ

OUR BOOKSHELF.

Quain's Elements of Anatomy. Eleventh edition. Vol. ii., part ii., Splanchnology. By J. Symington. Pp. x+392. (London: Longmans, Green and Co., 1914.) Price 10s. 6d. net.

In this further contribution to the eleventh edition of Quain's "Elements of Anatomy" Prof. Symington describes the following systems of the human body:—Digestive, Respiratory, and Urogenital. Two minor sections are devoted to the ductless glands and peritoneum, the latter being

written by Dr. P. T. Crymble. During the eighteen years which have elapsed since the tenth edition appeared—under the joint editorship of Sir Edward Schäfer and Prof. Symington—anatomists, physiologists, and particularly surgeons have altered our conception of the splanchnology of the human body in many and important details. These changes are reflected in the text and illustrations of the new edition of "Quain."

No one is better qualified to edit this standard work on human anatomy than Prof. Symington. We feel, however, that in giving the Belfast school its full due, Prof. Symington has done less than justice to those who live and work outside the limits of Belfast. One example will suffice. About twelve years ago a series of observations were made by Keith, Barclay Smith, and T. R. Elliott, which served to show that the contents of the small and great intestine were separated, not by a mechanical valvular apparatus as was formerly supposed, but by a muscular mechanism, similar in the manner of its action to a sphincter. Sir William MacEwen and Dr. A. F. Hertz have demonstrated the existence of an ileo-cæcal sphincteric mechanism in the living human body, and emphasised its functional and clinical significance. Yet in the text of this edition no mention is made of these observations, and the erroneous and antiquated description of a mechanical valve is reproduced. This is the more surprising because the illustrations of the ileo-cæcal junction, reproduced from the former edition, bear out the non-mechanical nature of the ileo-cæcal orifice.

(1) *The Great Ball on which we Live.* Pp. 249.

(2) *Our Good Slave Electricity.* Pp. 246. By C. R. Gibson. (London: Seeley, Service and Co., Ltd., 1915.) Price each volume, 3s. 6d.

MR. GIBSON has attempted with considerable success the solution of the old problem—how to interest children and at the same time instruct them. In the first volume he tells the story of the earth, and invites his readers to accompany him on imaginary visits to our planet before man's appearance on it. The fact that at one place a jelly-fish tells the story of what happened in the sea, and at another a worm records its experiences underground, will indicate the style of treatment adopted.

The second book describes in a similar simple manner some of the achievements of electrical science, and young readers will probably be led by these chapters to take up serious study later.

If it is possible to form sound elementary ideas of experimental and observational science merely by reading, it would be difficult to find more attractive introductions than Mr. Gibson has prepared.

Brown's Marine Electrician: for Sea-going Engineers. By A. E. and A. H. Larkman. Pp. xv+244. (Glasgow: James Brown and Son. Second edition, 1914.) Price 5s. net.

In this book "the authors seek to give practical information on such matters as the installation, repair, and use of electric lighting, heating, and